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EP 0516124 A2 EP 0429072 A2 JP 630227156 A
JP 610144164 A

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(54) **Automatic time of day calculation for a radio telephone, fax machine or computer**

(57) To determine the time of day which is local to the destination of an outgoing call from a first telephone to a second telephone, or to the origin of an incoming call to the first telephone, the first telephone extracts the prefix of the second telephone's number containing trunk code data and uses that prefix, or a derivative thereof, as a search key to retrieve time differences between geographical areas located in different time zones. The time differences are stored in a memory of the first telephone. The local time at the second telephone may be indicated on a display at the first telephone.

A similar arrangement may be used for a FAX machine or a computer attached to a modem.

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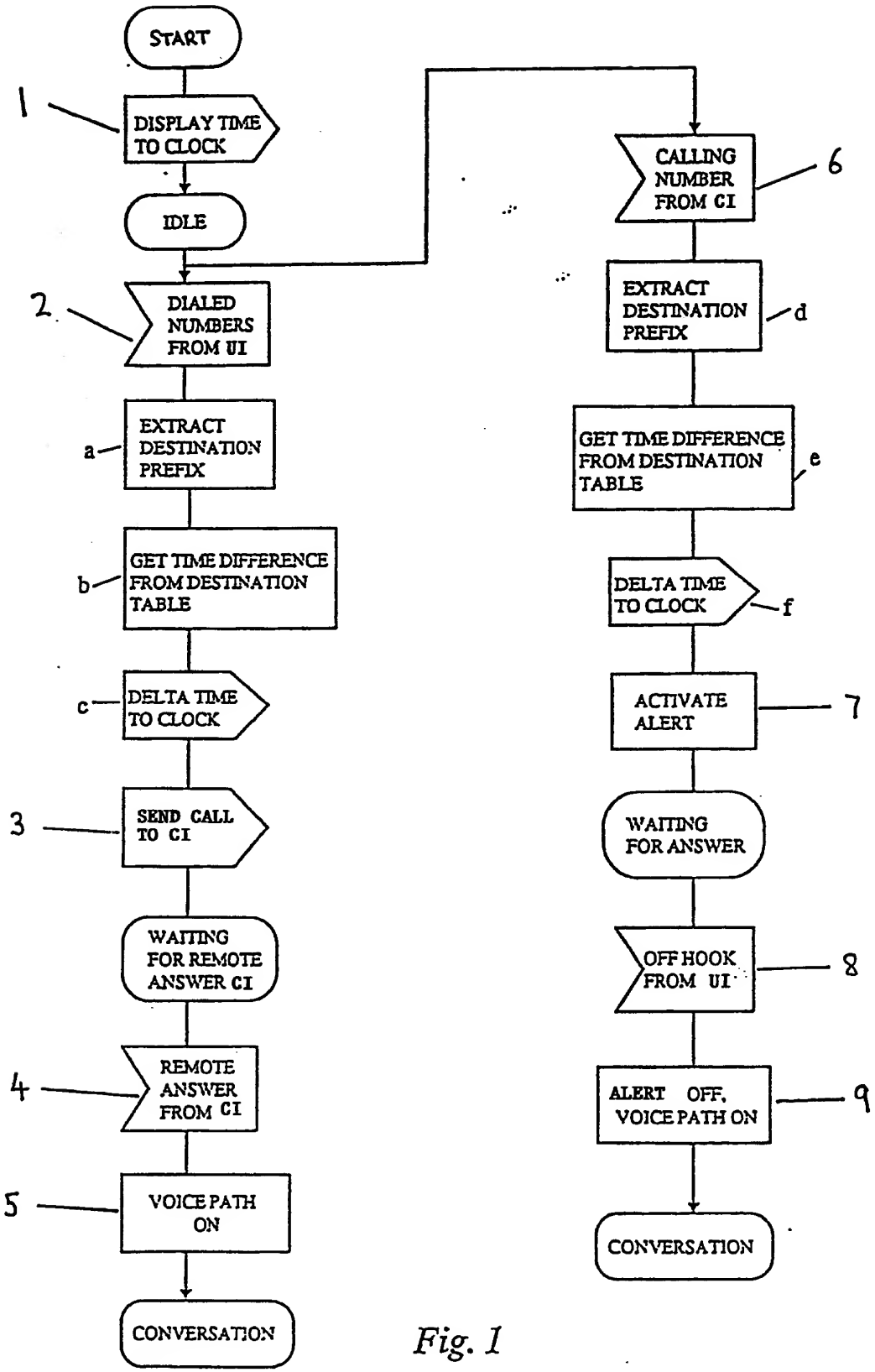
START
1
DISPLAY TIME TO CLOCK
IDLE
2
DIALED NUMBERS FROM UI
a
EXTRACT DESTINATION PREFIX
b
GET TIME DIFFERENCE FROM DESTINATION TABLE
c
DELTA TIME TO CLOCK
3
SEND CALL TO CI
WAITING FOR REMOTE ANSWER CI
4
REMOTE ANSWER FROM CI
5
VOICE PATH ON
CONVERSATION
CALLING NUMBER FROM CI
6
EXTRACT DESTINATION PREFIX
d
GET TIME DIFFERENCE FROM DESTINATION TABLE
e
DELTA TIME TO CLOCK
f
ACTIVATE ALERT
7
WAITING FOR ANSWER
OFF HOOK FROM UI
8
ALERT OFF, VOICE PATH ON
9
CONVERSATION

Fig. 1

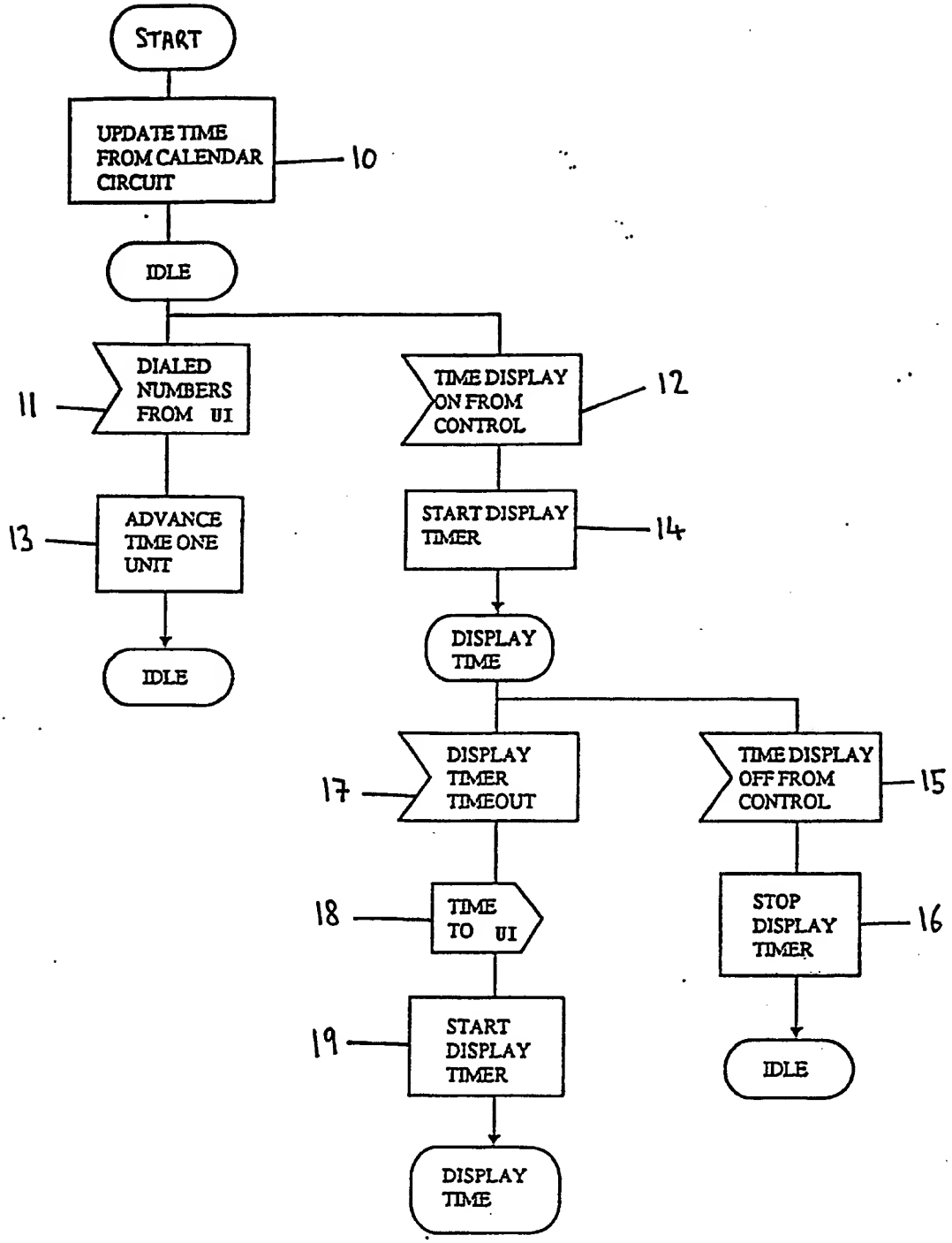
START
UPDATE TIME FROM CALENDAR CIRCUIT
10
IDLE
DIALED NUMBERS FROM UI
11
TIME DISPLAY ON FROM CONTROL
12
ADVANCE TIME ONE UNIT
13
START DISPLAY TIMER
14
IDLE
DISPLAY TIME
DISPLAY TIMER TIMEOUT
17
TIME DISPLAY OFF FROM CONTROL
15
TIME TO UI
18
STOP DISPLAY TIMER
16
START DISPLAY TIMER
19
IDLE
DISPLAY TIME

Fig. 2

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Automatic time of day calculation for a radio telephone

A method for providing a user of a first telephone with the time of day within a geographical location corresponding to the location of a second telephone.

Business and commerce are nowadays becoming increasingly international and consequently communication around the world is accomplished mainly by telephone. Particularly, in association with the development of extensive, multinational mobile networks, the contacts are not tied to time or place. Doing business in the business world frequently requires close cooperation between various departments, such as sales and marketing and most importantly the client. This means that availability of simultaneous contacts all over the world is necessary. The time difference between various countries generates additional difficulties in efficient business transactions. At worst, the time difference is simply forgotten in the midst of the rush, which may result in a telephone call being made at an inconvenient time of the day. In some cultures, such an incident would lead to a situation which is both detrimental and irretrievable. In an extreme case this may occur particularly when a first contact is made with a client who is important to the enterprise. Besides this during daily transactions such situations are often encountered in which time zone differences must be checked before making contact with someone in another country.

In known cellular telephone equipment a number of methods exist for automatically adjusting the telephone's clock when the telephone passes from one time zone to another.

The cells within cellular telephone networks usually only cover an area specific to one time zone. Therefore, travelling from one time zone to another will result in an eventual transfer between one cell and another.

According to one method, depending on the location of the telephone, time data

is received from one of a number of base stations, and the telephone recalibrates its own time in accordance with the reference time data of that base station.

In another method disclosed in EP 0 565 927 A1 a memory is used to store time difference data for a number of geographical locations. When the cellular telephone moves from one geographical area to another data is sent by the base station in the new area giving locational information. By using this information to obtain the time difference of the new location the old local time can be updated to give the local time in the new location.

In known mobile telephones a change of time zone, and correspondingly of the local time of day, is taken into account when crossing a boundary of the time zone. Data on the change in the time zone is transmitted directly from the base station to the mobile telephone which in turn changes its internal time clock to correspond to the new time zone. In the method described in EP 0 565 927, it is possible to determine and store the time differences of different geographical regions in advance in mobile telephones and to utilize such data for calculating the local time of day when crossing various time zones. Upon transferring to a new time zone the mobile country code of the new area is provided to the telephone. The new local time of day is then calculated using stored time differences and the local time of the old time zone. Hereby, in association with a transfer to a new time zone, the mobile country code of a new state (or area, if the country belongs to several time zones), is entered on the basis whereof a new local time of day is calculated utilizing the stored time difference data and the local time of the earlier time zone. The features like these described above serve the user of a mobile telephone well when he is moving between several countries.

It should be noted that the prior art methods described only relate to ways of adjusting the clock of a mobile telephone upon moving between different time zones.

A drawback of the prior art is that the telephone makes no use of the existing time difference data stored in the telephone for determining the time of day in the destination of a call.

According to a first aspect of the invention there is provided a method for providing a user of a first telephone with the time of day within a geographical area corresponding to a second telephone, the method comprising the steps of: the first telephone having data input thereto indicative of the geographical area corresponding to the second telephone; and the first telephone using said data as a search key to retrieve information corresponding to the time of day for said geographical area from a storage device associated with the first telephone, and according to a second aspect of the invention there is provided a telephone, comprising: first means for receiving data indicative of the geographical area corresponding to a second telephone; and second means adapted to utilise said data as a search key to retrieve information indicative of the time of day for said geographical area from a storage device associated with the first telephone.

A method and apparatus in accordance with the invention has an advantage that when a first person is phoning someone else in another part of the world they are automatically supplied with the time of day in that location. This saves the first person having to initially find exactly where the other person resides and secondly to calculate the time in that location using time zone information. This method and apparatus is particularly useful for mobile telephone users who may not be in a suitable situation for working out time zone differences, for example, someone driving a car provided with a mobile telephone unit.

In a preferred embodiment the method and apparatus for determining the time of day within a geographical area of the second telephone employs the use of the second telephone's number. Telephone numbers generally give information on the location of the telephone, e.g. area code, thus making them ideal for use in a method in accordance with the invention.

Suitably by inputting the telephone number of the second telephone number via a communication channel between the first and second telephones the method and apparatus provides the user with the time of day relating to the second telephone when receiving a telephone call.

Optionally by inputting the telephone number of the second telephone number by the user retrieving or entering said number the method and apparatus may also provide the user with the time of day relating to the second telephone when making a telephone call.

The time of day of an area of origin of a received call may also be determined in a similar fashion as the time of day of a destination area of a call to be transmitted, provided that the telephone network between the transmitter and the receiver supports the transfer of the numerical data.

Advantageously, a time difference table has been drawn up in the form of a two-dimensional array in which absolute time difference cells are provided for each destination area relative to each transmission area. The table is read with two search keys, these being the previously extracted trunk codes, or derivatives thereof, corresponding to both the transmission and destination locations. The time difference is thus simply obtained by means of one memory search.

Displaying the time of day of the destination district is optional. The time of day may be guided on to the display after activating a special key or keying sequence.

The method and apparatus according to the invention will now be described, by way of example, with reference to the accompanying drawings, in which:

Figure 1 is a flow chart representing selection and reception control of a telephone call in accordance with the invention; and

Figure 2 is a flow chart representing the clock control of a telephone in accordance with the invention.

Referring to figure 1, there is shown a flow chart representing the processes involved in sending and receiving a telephone call. Initially the clock displays the present time within the locality of the telephone, as in block 1. The telephone then remains idle until either a call is received from the communication interface (CI), or a telephone number is dialled into the user interface (UI). Once a telephone number is dialled, it passes from the UI to the processor, as in block 2. Similarly upon receiving a telephone call the calling telephone number, which is supplied by the telephone network, passes from the CI to the processor, as in block 6. The received telephone number of the other telephone is converted by the processor into time difference data, as in steps a,b,c and steps d,e,f. In the first step represented by blocks a/d the trunk code data (country code and area code) associated with the telephone number are extracted. The trunk code data thus obtained is utilized in blocks b/e where the time difference corresponding to the trunk code is read from the table in the telephone memory. The trunk code information may serve directly as a table search key or it can be coded in different forms to be suitable for the purposes of the search.

The time difference read from the table can be a relative time difference, for example, with respect to GMT, or it can be an absolute time difference between the locations of the two telephones. The absolute time difference is calculated by subtracting the relative time difference of the destination location from the relative time difference of the transmission location. For example, when making a telephone call from Finland to Japan, at 12:00 local time, the relative time differences with respect to GMT are +2 hours for Finland and +9 hours for Japan, so that the absolute time difference is +7 hours, which corresponds to a local time of 19:00 in Japan. When making a call in the opposite direction, the equivalent calculation yields -7 hours for the absolute time difference.

In blocks c/f an absolute time difference including a sign enters the clock

circuitry, which then calculates the time of day of a destination area by adding the absolute time difference (including the sign) to the local time of day obtained from the real time clock of the telephone.

The processes for sending of a telephone call are continued in blocks 3, 4, and 5 until a connection is finally made resulting in a conversation. Similarly the processes for receiving a telephone call are continued in blocks 7, 8, and 9 until a connection is finally made resulting in a conversation

Referring to figure 2, there is shown a flow chart representing the clock control of the telephone. Initially the time is updated from the calender circuit within the telephone, as in block 10. The clock control then remains idle until a number is dialled from the user interface (UI), as in block 11, or the time display is set to 'on' from the control, as in block 12. Upon dialling a number the time is advanced one unit, as in block 13, and following this the clock control passes into an idle state. Alternatively, if the time display is set to 'on' then the display timer is started, as in block 14, and the time is displayed. If the time display is subsequently set to the 'off' state before the timeout period, as in block 15, the display timer is stopped, as in block 16, and the clock circuit passes into an idle state. Should the timeout period be reached, as in block 17, then the updated time is sent to the UI, as in block 18, and the display timer is started again, as in block 19, before the new time is displayed.

In the figure 2, the impulse block 12 activates the displaying of the time of day. Such an impulse may be output directly by the real time clock circuit when the time of day of the destination area of a call has been formed, or an impulse can be provided by means of a given key or keying sequence, wherewith the user may have the option, if desired, to direct the time of day of the destination area to the display of the telephone. The time-of-day display option can be implemented in a number of ways. It may be a single operation so that the display of the time of day of a destination area is in principle set either on or off in the telephone, or a display can be activated, for instance with a key after the

selection sequence of a call, said activity being thus optional for each call.

A time difference table suitable for use in an embodiment of the present invention is located in the memory of the telephone. The table may, instead of the relative time differences, include the absolute time differences between different locations, whereby the number of cells included in the table is increased compared to the table containing relative time differences because the absolute time difference table must be presented in the form of two-dimensional matrix showing the time difference combinations of all locations. In such an instance, two search keys are required instead of one, namely, the search keys corresponding to both the transmission location and the destination location. The absolute time difference between the locations may then be obtained with one memory search.

The contents of the table may be fixed or they may be provided by the user either entirely or partly. Optionally a table may be used which includes the relative time differences world-wide, to which the user is able to add a limited number of absolute, that is, already calculated time difference data which are most frequently used. The addition of said absolute time difference data may also be performed on a learning principle, whereby the telephone itself is enabled to store a given number of most frequently used time difference data in the memory and, when need be, to take them in use as a kind of rapid selection.

In view of the foregoing description it will be evident to a person skilled in the art that various modifications may be made within the scope of the invention.

For example the description and claims refer to a telephone but optionally a fax machine or a computer attached to a modem are equally suitable.

The scope of the present disclosure includes any novel feature or combination of features disclosed therein either explicitly or implicitly or any generalisation thereof irrespective of whether or not it relates to the claimed invention or

mitigates any or all of the problems addressed by the present invention. The applicant hereby gives notice that new claims may be formulated to such features during prosecution of this application or of any such further application derived therefrom.

Claims

1. A method for providing a user of a first telephone with the time of day within a geographical area corresponding to a second telephone, the method comprising the steps of:

the first telephone having data input thereto indicative of the geographical area corresponding to the second telephone; and

the first telephone using said data as a search key to retrieve information indicative of the time of day for said geographical area from a storage device associated with the first telephone.

2. A method according to claim 1 wherein said data comprises at least part of a telephone number of the second telephone.

3. A method according to claim 2 wherein the at least part of a telephone number of the second telephone is input to the first telephone via a communication channel between the first and second telephones.

4. A method according to claim 2 wherein the at least part of a telephone number of the second telephone is input to the first telephone by the user retrieving or entering said telephone number.

5. A method according to any preceding claim wherein the said information is stored in the form of a two dimensional array.

6. A method according to claims 1 to 4 wherein the said information is stored in the form of a one dimensional array.

7. A method according to any preceding claims further comprising the step of displaying the time of day on a display of the first telephone.

8. A telephone, comprising:

first means for receiving data indicative of the geographical area corresponding to a second telephone; and

second means adapted to utilise said data as a search key to retrieve information indicative of the time of day for said geographical area from a storage device associated with the first telephone.

9. A telephone as claimed in claim 8, wherein said first means is adapted to receive data comprising at least part of a telephone number of the second telephone.

10. A telephone as claimed in claims 8 or 9, wherein said first means is adapted to receive the data from a communication channel between the first and second telephones.

11. A telephone as claimed in claims 8 or 9, wherein said first means is adapted to receive the data from a user interface of the first telephone.

12. A telephone as claimed in claims 8 to 11, wherein said storage device stores said information in the form of a two dimensional array.

13. A telephone as claimed in claims 8 to 11, wherein said storage device stores said information in the form of a one dimensional array.

Patents Act 1977
Examiner's report to the Comptroller under Section 17
(The Search report)

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Relevant Technical Fields

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(ii) Int Cl (Ed.6) G04G 9/00; H04M 1/00, 1/21, 1/57, 3/42, 11/06; H04Q 3/00, 7/22, 7/32, 7/38

Search Examiner
MR M J BILLING

Date of completion of Search
14 MARCH 1995

Databases (see below)
(i) UK Patent Office collections of GB, EP, WO and US patent specifications.

(ii) ONLINE DATABASES: WPI

Documents considered relevant following a search in respect of Claims :-
1 TO 13

Categories of documents

X: Document indicating lack of novelty or of inventive step.

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A: Document indicating technological background and/or state of the art.

P: Document published on or after the declared priority date but before the filing date of the present application.

E: Patent document published on or after, but with priority date earlier than, the filing date of the present application.

&: Member of the same patent family; corresponding document.

Category	Identity of document and relevant passages		Relevant to claim(s)
X	EP 0516124 A2	(SONY) column 3 lines 6-30	1,2,4,7,8, 9,11 at least
X	EP 0429072 A2	(MITSUBISHI) column 2 lines 11-47	1,2,8,9,11 at least
X	JP 630227156	(CANON) & Patent Abstracts of Japan Vol. 13 No. 23 (E-705), 19 January 1989, page 123	1,2,4,7,8, 9,11 at least
X	JP 610144164	(RICOH) & Patent Abstracts of Japan, Vol. 10 No. 340 (E-455), 18 November 1986, page 124	1,2,3,7,8, 9,10 at least

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